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14. ABSTRACT Investigators participated within the planning phase of the Tidal Flats Department Research Initiative (DRI) to help design and site a series of large collaborative field experiments. The work included meetings and field trips to characterize potential sites, as well as logistical concerns. Emphasis was on integrating remote (infrared imagery) and in situ (thermistor) field sensing of thermal signals into the experiment plan.						
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## *Final Report*

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### **Exploitation of Thermal Signals in a Tidal Flat Environment - Planning**

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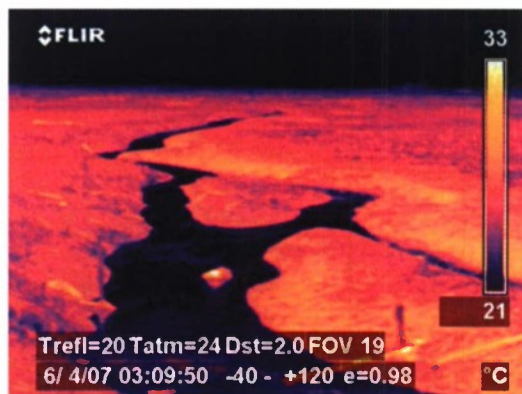
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### **ABSTRACT**

Investigators participated within the planning phase of the Tidal Flats Department Research Initiative (DRI) to help design and site a series of large collaborative field experiments. The work included meetings and field trips to characterize potential sites, as well as logistical concerns. Emphasis was on integrating remote (infrared imagery) and in situ (thermistor) field sensing of thermal signals into the experiment plan.

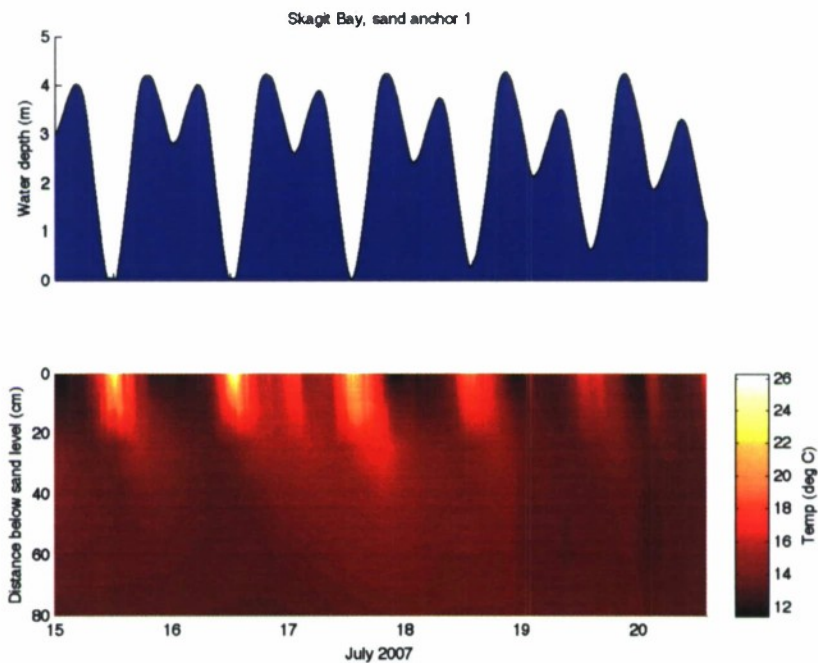
### **WORK COMPLETED**

Investigators attended DRI planning meetings in Hawaii and South Korea, scouted field sites Washington State, begun development of new methods, and collected preliminary data. The preliminary data include infrared images from Korean sites (Figure 1), and sediment temperature profiles from Washington State sites (Figure 2).



*Figure 1. Infrared image of a tidal flat (warm signal) and channel (cold signal) at Marisan Beach, South Korea. Such thermal signals are common on tidal flats.*

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**Figure 2. Tide (upper panel) and sediment temperature profiles (lower panel) recorded near English Boom Park, Skagit Bay, WA. At low tide the upper layer of sediment is heated by solar radiation, and this heat is conducted downwards over time.**

## RESULTS

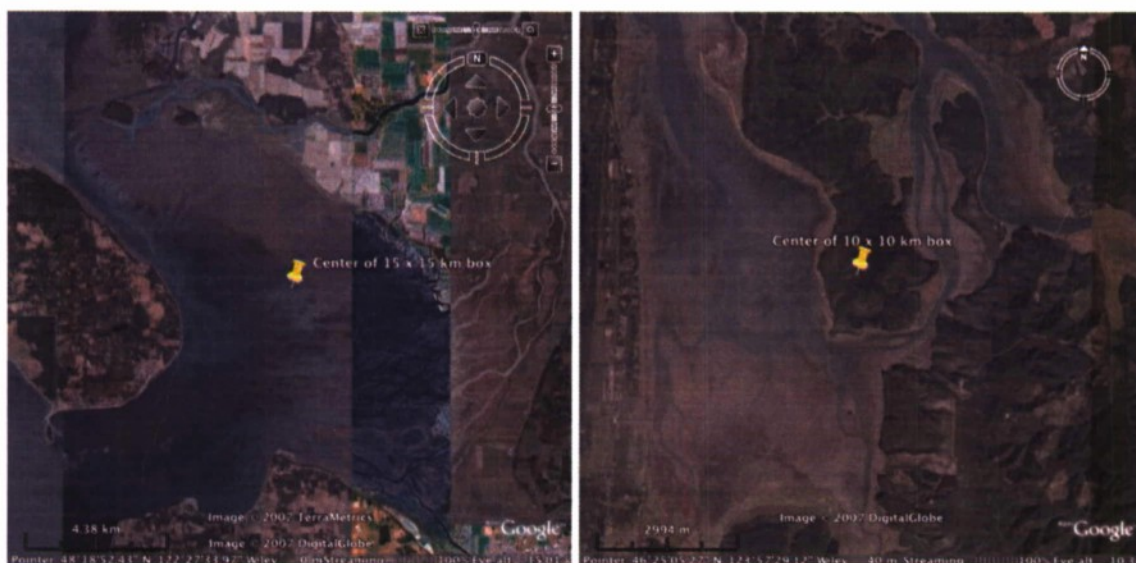
Two local field sites were selected for the Tidal Flats DRI. Figure 3 shows satellite images of the Skagit Bay and Willapa Bay, both of which have been documented thorough field trips and collection of existing resources (i.e., data, publications, personal communications). This information has been prepared for distribution the DRI community at large via a website [www.tidalflats.org](http://www.tidalflats.org). Additional results include the confirmation of significant thermal signals (eg, Figures 1 & 2) at each field site.

The Skagit Bay site is a predominately sandy tidal flat with active braided channels, although pockets of mud suggest that fine particles (i.e., mud and silt) are present in the system and being transported through the flats to deeper regions [McBride *et al.*, 2006]. The river input is large, with an average peak flow of 71,310 cfs (north and south forks combined, <http://waterdata.usgs.gov/nwis/uv?12200500>). At the northern end of the bay, there is a region of relic (eroding) mud, possibly owing to the construction of a breakwater. Along the southern perimeter of the bay, an active depositional band of mud exists within a few hundred meters of the shoreline. The spring tidal range is 4 m (<http://www.cfdnet.com:8080/locations/3237.html>).

The Willapa Bay site is predominantly muddy tidal flat with stable meandering channels, although a few sandy areas are present at the seaward edges [Ferraro and Cole, 2007].



River input is small, with an average annual peak flow of 14,680 cfs (Naselle and Willapa Rivers combined, <http://waterdata.usgs.gov/nwis/uv?12200500> , <http://waterdata.usgs.gov/nwis/uv?12013500> ). The southern portion of the bay is extremely muddy and difficult to traverse. The spring tidal range is 4 m (<http://www.cfdnet.com:8080/locations/4603.html> ).



**Figure 5. Tidal Flats DRI domestic field sites. The Skagit Bay (left image) is an approximately 15 x 15 km site centered at 48°18'52.43"N 122°27'33.97"W. The Willapa Bay (right image) is an approximately 10 x 10 km site centered at 46°25'14.67"N 123°57'34.46"W.**

## REFERENCES

- Ferraro, S.P. and F.A. Cole, 2007, Benthic macrofauna-habitat associations in Willapa Bay, WA, USA, *Estuarine, Coastal, and Shelf Science*, 71.
- McBride, A., K. Wolf, and E.M. Beamer, 2006, Skagit Bay Nearshore Habitat Mapping.